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MANAGEMENT OF COMMERCIAL RADIOACTIVE NUCLEAR WASTES
A STATUS REPORT

FEDERAL ENERGY ADMINISTRATION

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Management of Commercial Radioactive Nuclear Wastes

A Status Report

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FOREWORD

The President's Energy Resources Council (ERC) has the responsibility for coordination of Administration policies and programs relating to energy. Because of the important role envisioned for nuclear power in the next decade and beyond, the ERC established a nuclear subcommittee to coordinate Federal nuclear policy and programs to assure that issues which arise are treated via an integrated Government effort.

This paper was prepared by those Federal agencies which are ERC members and have the technical, economic, and environmental expertise to provide a brief review of the nature of radioactive wastes and our ability to dispose of them safely.

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THE MANAGEMENT OF COMMERCIAL RADIOACTIVE WASTES

I. SUMMARY

- ° Because of the national need to reduce dependence on insecure sources of imported oil, our limited ability to expand oil and gas production, use of domestic coal and nuclear power must increase substantially. FEA's 1976 National Energy Outlook indicates that nuclear power must expand from 9 percent of electric generation today to roughly 25 percent by 1985 to meet growing energy demands.
- ° Radioactive wastes are an inevitable by-product of nuclear energy production.
 - Radioactive wastes must be carefully processed, handled and isolated from the public until radioactivity decays to harmless levels. Thousands of years are required for radioactivity levels of some of these wastes to fall to levels of naturally occurring materials.
- ° It is scientifically and technologically feasible to manage these radioactive wastes in a safe manner. This is based on the knowhow and technology amassed through research, development and demonstration as documented in ERDA's comprehensive report titled, "Alternatives for Managing Wastes

from Reactors and Post-Fission Operations in the LWR Fuel Cycle." This document explains the technological options available to achieve multiple barrier isolation which includes three successive steps: (1) solidification of high-level nuclear wastes to a stable form, (2) the encapsulation of the solid, and (3) the storage of the containers in known stable underground geologic formations.

- ° The record in managing radioactive wastes over the last 30 years includes both favorable experience and instances where problems have occurred. While there have been no discernible health or safety effects on the public from these activities, the experience gained has benefited future planning, and should minimize problems when large-scale commercial operations begin.
- ° The Federal Government has accepted the responsibility for assuring the safe and environmentally sound management of nuclear wastes. This objective is being fulfilled through a recently accelerated, comprehensive government waste program plan calling for:
 - Extensive environmental assessments and impact statements, prior to decisions on reprocessing,

recycle, waste forms, storage modes, and packaging criteria.

- Selection of specific technologies for waste solidification.
 - Selection and qualification of waste terminal storage sites.
 - Demonstration and completion of technical development for commercial scale operations.
 - Completion of environmental, safety and related regulatory standards, criteria and reviews to assure acceptable radioactive waste management practices.
 - An interagency task force to coordinate these activities among the responsible federal agencies.
- ° The program is scheduled to satisfy the need for waste terminal storage facilities in a timely manner.
 - ° Radioactive waste volumes are small compared to other wastes produced by our society. Thus, even substantial costs that could be required for careful disposal of such wastes will not have substantial impact on the cost of electricity.

II. CATEGORIES AND SOURCE OF RADIOACTIVE WASTES

- ° Nuclear power generation produces several types of wastes which can be classified as follows:

- (1) High-level radioactive wastes which must be delivered to Federal repositories for long-term management, and
 - (2) Low-level radioactive wastes which may be disposed of by near-surface land burial in commercial burial grounds.
- ° Fission products and those transuranic elements included in high-level wastes are by-products produced during nuclear power generation and remain contained in the spent nuclear fuel elements.
 - ° Spent fuel elements may be reprocessed to extract useable fuels. NRC is in the process (technical reviews, specific studies, environmental impact statements) of rendering a final decision on the permissibility of recycle of plutonium which is the principal transuranic element by-product from such reprocessing and which can be used as a fuel in nuclear reactors.
 - When fuel is reprocessed to separate wastes from useable fuels, most of the fission products and a small unrecoverable fraction of the useable fuel would be separated into a liquid high-level waste stream. If no reprocessing takes place, spent fuel elements themselves would constitute high-level waste

and could be put into terminal storage.

- Federal regulations require the conversion of high-level liquid wastes to a stable solid form and their delivery to a Federal repository for terminal storage.

- ° The second waste type includes low-level wastes such as contaminated materials having low levels of radioactivity usually not requiring much shielding nor extensive isolation measures.

III. TECHNOLOGY AND EXPERIENCE AVAILABLE FOR THE MANAGEMENT OF RADIOACTIVE WASTES

- ° The necessary base technology has been developed to meet future nuclear waste management requirements.
- ° The technical alternatives available to achieve each step of management including processing or non-processing of spent fuel are detailed in a comprehensive ERDA report titled, "Alternatives for Managing Wastes from Reactors and Post-Fission Operations in the LWR Fuel Cycle". For the management of high-level wastes produced from reprocessing, for example, the ERDA report indicates that:
 - Reprocessed commercial liquid waste can be solidified to a stable solid form such

as glass. This capability has already been demonstrated by pilot plant solidification of simulated waste.

- There are a variety of known stable types of geologic formations such as salt beds, salt domes, and granite, where solidified, containerized waste can be stored underground.
- ° Technical feasibility analyses of underground multiple barrier storage systems indicate that high-level wastes can be isolated from the public in a manner that requires little surveillance.
- Multiple options for solid waste form, containers, and storage sites will continue to be pursued. This does not reflect uncertainties over the feasibility of technology, but is aimed at assuring development of acceptable waste management on a timely basis.
- Storage sites can be selected to minimize transportation requirements.
- ° Radioactive waste volumes are small compared to other wastes produced by our society. Thus, even the substantial costs that could be required for careful disposal of such wastes will not have significant impact on the cost of electricity.

- ° Commercial low-level wastes, which are more voluminous than high-level wastes, can be safely disposed of through burial of solidified wastes in properly selected and controlled land burial sites. Current Federal efforts seek to improve site selection, management procedures, and regulation to assure safe disposal.
- ° The record in managing wastes over the past 30 years includes both favorable experience and instances where problems occurred. While there have been no discernible health or safety effects on the public from these activities, both the good experience and the problems have benefited future planning, and should minimize problems when large scale commercial operations begin.

IV. GOVERNMENT AGENCY RESPONSIBILITIES

- ° Several agencies of the Federal government have responsibilities for waste management as follows:
 - The Energy Research and Development Administration is responsible for development of environmentally safe waste management technology and for establishing and managing Federal radioactive waste repositories.

- The Nuclear Regulatory Commission establishes safety and environmental standards and criteria, and the licensing and inspection of handling, processing and storage facilities.
- The U.S. Geological Survey advises on and assists in providing the needed geologic and hydrologic data for waste storage sites.
- The Environmental Protection Agency establishes general environmental standards which must be met in connection with waste activities.
- States, pursuant to agreements with NRC, have surveillance over low-level waste disposal and storage facilities.

V. WASTE MANAGEMENT PROGRAM IMPLEMENTATION

- ° Selection and implementation of the most appropriate of the existing and improved technologies will require:
 - The thorough reviews mandated by the National Environmental Policy Act.
 - The promulgation and satisfactory compliance with generally applicable

environmental standards and criteria issued by the Environmental Protection Agency.

- Compliance with licensing criteria and requirements of the Nuclear Regulatory Commission.
- Opportunities for full public participation.
- ° A Federal interagency task force was established to assure coordination of these activities which are being carried out by responsible Federal agencies.
- ° The commitment to provide adequate resources to achieve these high-level and related commercial waste management program objectives has been made by the Administration.
- Proposed funding of ERDA's commercial radioactive waste program is being more than quadrupled to \$60,000,000 in fiscal year 1977 to:
 - Expand the program for selection of several Federal repository sites.
 - Accelerate work toward a commercial basis of technology for the solidification of wastes.

- Accelerate work on final disposition of spent fuel from nuclear reactors, or containerized solidified waste in geologic formations.
- ° The timetable for major events in the management of commercial radioactive wastes including actions already taken:

1976

- ERDA announced an expanded program to develop Federal repositories in deep geologic formations for terminal storage of radioactive waste.
- ERDA identified candidate high-level waste solid forms for terminal storage.
- President's FY '77 Budget requested, and the Joint Committee on Atomic Energy has approved, funds to accelerate programs for:
 - selection of sites and construction of storage facilities, and
 - development of selected commercial scale solidification process technology and process designs

- ERDA established a terminal storage facility program management office at Oak Ridge, Tennessee.
- ERDA has issued for public review the Technical Alternatives Document.
- NRC will circulate preliminary revised waste form and packaging regulations for comment.
- EPA/NRC, with the assistance of USGS, will evaluate commercial low-level waste land burial sites and will determine criteria on radioactivity levels for wastes to be delivered to each site.
- ERDA will issue a draft generic environmental impact statement on reprocessing.

1977

- ERDA will issue a draft generic environmental impact statement on the management of commercial radioactive wastes for public review and comments.
- EPA will determine general performance criteria for establishment of new low-level waste land burial sites.

- NRC will publish an environmental impact statement for revised waste management regulation.
- ERDA will publish a final environmental impact statement on reprocessing and announce a decision thereon.
- NRC will announce its decision on plutonium recycle.
- ERDA will publish a final generic environmental impact statement on management of commercial radioactive wastes.

1978

- NRC will publish final regulations for waste form and packaging criteria.
- ERDA will announce a decision on waste forms, storage modes, and packaging criteria to be used as basis for designing terminal storage facility.
- EPA will establish general environmental standards applicable to high-level waste management.
- ERDA will select site(s) for the underground excavation phase of the radioactive

waste geologic program. (This action will be subject to the appropriate site-specific environmental impact statement.)

- NRC will establish criteria for long-term care for new low-level waste burial sites.

1979

- NRC will establish site selection criteria for new low-level burial grounds.

1985

- ERDA will start receiving solidified waste in pilot plant operations in a geologic terminal storage facility.
- ° The dates shown for major regulatory actions are estimates provided by the NRC. The NRC, an independent regulatory agency, points out that these dates cannot be predicted with certainty. Based on experience with regulatory process lead time, however, the time allowed in the program should prove sufficient to allow for full decision-making processes, including public participation.